Problem 41

The density of nuclear matter is about 10^{18} kg/m^3. Given that 1 mL is equal in volume to cm^3, what is the density of nuclear matter in megagrams per microliter (that is, Mg/μL)?

Solution

Convert this density to megagrams per microliter by multiplying by the appropriate conversion factors.

$$\begin{aligned}
10^{18}\ \frac{\text{kg}}{\text{m}^3} &= 10^{18}\ \frac{\cancel{\text{kg}}}{\cancel{\text{m}^3}} \times \frac{10^3\ \cancel{\text{g}}}{1\ \cancel{\text{kg}}} \times \frac{1\ \text{Mg}}{10^6\ \cancel{\text{g}}} \times \left(\frac{1\ \cancel{\text{m}}}{100\ \cancel{\text{cm}}}\right)^3 \times \frac{1\ \cancel{\text{cm}^3}}{1\ \cancel{\text{mL}}} \times \frac{1000\ \cancel{\text{mL}}}{1\ \cancel{\text{L}}} \times \frac{1\ \cancel{\text{L}}}{10^6\ \mu\text{L}} \\
&= \frac{10^{18} \times 10^3 \times 1000}{10^6 \times 100^3 \times 10^6}\ \frac{\text{Mg}}{\mu\text{L}} \\
&= \frac{10^{24}}{10^{18}}\ \frac{\text{Mg}}{\mu\text{L}} \\
&= 10^6\ \frac{\text{Mg}}{\mu\text{L}}
\end{aligned}$$